

## SPECIFICATION

### CABLE ASSEMBLY WITH POWER ADAPTER

#### CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This patent application is related to U.S. Patent Application Serial Nos. 10/385,794 filed on March 10, 2003 and entitled “ELECTRICAL ADAPTER”, 10/668,739 filed on September 23, 2003 and entitled “CABLE ASSEMBLY WITH POWER ADAPTER”, both of which are invented by the same inventor and assigned to the same assignee as this application.

#### BACKGROUND OF THE INVENTION

##### 1. Field of the Invention

**[0002]** The present invention relates to a cable assembly, and particularly to a cable assembly having a cable connector and a power adapter respectively for signal and power transmission.

##### 2. Description of Related Art

**[0003]** In recent days, an electrical connector known as a Serial Advanced Technology Attachment (Serial ATA) connector, according to the newly developed Serial ATA interface standard, is developed to be generally used for connecting storage peripheral devices such as hard disk drives with a mother printed circuit board so as to achieve signal or power transmission therebetween. The Serial ATA connector has many advantages such as low voltage requirement, low pin count and high speed transmission.

**[0004]** A pair of Serial ATA power cable assemblies are generally employed to perform power transmission between the storage peripheral device and the mother printed circuit board. Each Serial ATA power cable assembly comprises a cable with two Serial ATA power connectors terminating at two opposite ends thereof, one of which is connected to the mother printed circuit board or the storage peripheral device and another of which is adapted to mate with one of the connectors of another cable assembly. When the two matable Serial ATA power connectors mate with each other, a power transmission is thus established between the storage peripheral device and the mother printed circuit board. However, in some particular circumstances, the two matable Serial ATA power connectors of the pair of cable assemblies do not directly mate with each other. Accordingly, a power adapter is required for connecting these two matable Serial ATA power connectors together.

**[0005]** On the other hand, two separate connectors are generally provided to respectively perform the signal and power transmission between the storage peripheral device and the mother printed circuit board. However, forming the two separate connectors is expensive and inconvenient compared to the formation of a unitary member which can perform the functions of signal and power transmission.

**[0006]** Hence, a cable assembly having a cable connector and a power adapter respectively for signal and power transmission is highly desired.

## SUMMARY OF THE INVENTION

**[0007]** Accordingly, an object of the present invention is to provide a cable assembly having a cable connector and a power adapter respectively for signal and

power transmission with inlaid bolts.

**[0008]** In order to achieve the object set forth, a cable assembly in accordance with the present invention comprises a first connector, a cable and a second connector both electrically connecting to the first connector. The first connector comprises a first insulating housing having an elongated base extending in a lengthwise direction with a first and a second mating ports integrally extending from one side thereof, and a plurality of first and second contacts received in the first and the second mating ports in a lateral direction perpendicular to the lengthwise direction, respectively. The cable and the second connector are attached to the other side of the base in the lengthwise direction. The cable comprises a plurality of conductors electrically connecting with the first contacts. The second connector comprises a second housing back to back assembled to the first housing and a plurality of third contacts electrically connecting with the second contacts. The base of the first insulating housing defines a pair of fitting spaces extending in the lengthwise direction and a pair of mounting holes extending in the lateral direction and respectively communicating with the fitting spaces. A pair of screw caps are respectively assembled to the fitting spaces in the lateral direction.

**[0009]** Other objects, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0010]** FIG. 1 is an exploded, perspective view of a cable assembly in accordance with the present invention;

[0011] FIGS. 2 and 3 are views similar to FIG. 1, but taken from different aspects;

[0012] FIG. 4 is a partially assembled, perspective view of the cable assembly shown in FIG. 1;

[0013] FIGS. 5 and 6 are views similar to FIG. 4, but taken from different aspects;

[0014] FIGS. 7-9 are different perspective views showing the cable assembly, a panel on which the cable assembly is mounted and a pair of bolts;

[0015] FIG. 10 is a front, plane view of the cable assembly of FIG. 6;

[0016] FIG. 11 is a cross-sectional view taken along line 11-11 of FIG. 4; and

[0017] FIG. 12 is a cross-sectional view taken along line 12-12 of FIG. 4.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0018] Reference will now be made in detail to the preferred embodiment of the present invention.

[0019] Referring to FIGS. 1-3, a cable assembly 100 in accordance with the present invention comprises a first connector 1, a second connector 2 back to back assembled to the first connector 1, a cable 3 terminated to the first connector 1 and

a cover 4 overmolded with the cable 3 and the first connector 1. In a preferred embodiment, the first connector 1 is a Serial Advanced Technology Attachment (Serial ATA) receptacle connector. The second connector 2 is a Serial ATA plug connector. The cable 3 is a Serial ATA cable.

**[0020]** The first connector 1 comprises a first insulating housing 10, a plurality of first and second receptacle contacts 11, 12 retained in the first housing 10, and a pair of screw caps 5 assembled to the first insulating housing 10. The first housing 10 has an elongate base 102 and a mating section 104 extending perpendicularly and forwardly from a front face 102a of the base 102. A pair of guiding posts 101 is disposed at opposite ends of the mating section 104 for guiding the first connector 1 to mate with a first complementary connector (not shown).

**[0021]** Referring to FIGS. 1-3 in conjunction with FIGS. 5-6, the mating section 104 includes a first and a second mating ports 104a, 104b arranged in a side-by-side manner wherein the first mating port 104a has a lengthwise dimension smaller than that of the second mating port 104b. A polarizing key 108 (FIG. 8) is formed on the mating section 104 and closely adjacent to the base 102. The base 102 defines a cavity 1020 extending therethrough to communicate with the second mating port 104b, and a plurality of holes 1021 and slots 1022 located at upper and lower sides of the cavity 1020. The base 102 is formed with a projection 1022a (shown in FIG. 12) in each slot 1022. The base 102 defines a receiving space 1023 corresponding to the first mating port 104a in a rear face 102b thereof, and a pair of depressions 1024 communicating with the receiving space 1023 in top and bottom faces thereof. The base 102 is further formed with a pair of barbs 1025 in the receiving space 1023 and forms a pair of flanges 107 at opposite ends thereof. The first housing 10 defines a plurality of first passageways 105 communicating

with the first mating port 104a and the receiving space 1023, and a plurality of second passageways 106 communicating with the second mating port 104b and the cavity 1020. Each flange 107 of the base 102 defines a mounting hole 1071 extending from the front face 102a to the rear face 102b.

**[0022]** Particularly referring to FIGS. 5-6, a fitting space 1073 is defined in the flange 107 in a lengthwise direction of the base 102 to communicate with the rear face 102b and the mounting hole 1071. A plurality of first blocks 1074 are respectively formed on opposite upper and lower surfaces and a side surface of the fitting space 1073 adjacent to the rear face 102b. A swallow-tailed second block 1075 and a pair of third blocks 1076 are respectively formed on a front surface of the fitting space 1073 adjacent to the front face 102a of the base 102. The pair of third blocks 1076 extend along the lengthwise direction of the base 102, while the second block 1075 extends along a direction perpendicular to the lengthwise direction. It is noted that for complying with the molding consideration, to form the first blocks 1074, the flange 107 requires to form the through openings 1070 in alignment with the first blocks 1074, respectively, along a front-to-back direction. On the other hand, an M-shaped through slot is formed in the flange 107 so as to form a deflectable finger 1078 with the second block 1075 on the back for allowing installation of the screw cap 5 into the fitting space 1073 along the lengthwise direction.

**[0023]** in conjunction with FIGS. 11-12, the first and the second receptacle contacts 11, 12 are assembled into the first and the second passageways 105, 106, respectively. The first receptacle contacts 11 has four signal contacts and three ground contacts and each include an engaging portion 110 received in the first mating port 104a, a tail portion 112 rearwardly extending out of the base 102 for connecting to the cable 3, and an intermediate portion 114 interconnecting the

engaging portion 110 with the tail portion 112. The second receptacle contacts 12 are power contacts and each include a contact portion 120 received in the second mating port 104b, a connecting portion 122 extending rearwardly beyond an inner face of the cavity 1020, and a middle portion 124 interconnecting the contact portion 120 and the connecting portion 122.

**[0024]** Referring to FIG. 6, each screw cap 5 is a standard element for economy and comprises a cylindrical post 50 with a threaded hole 52 defined through the cylindrical post 50. The screw caps 5 are respectively received in the fitting space 1073 of the flanges 107 of the base 102. The first blocks 1074 respectively abut against a rear face of the cylindrical post 50 of the screw cap 5 for preventing the screw cap 5 from separating from the fitting space 1073. The second block 1075 and the pair of third blocks 1076 are respectively abut against the peripheral of the screw cap 5 for preventing the screw cap 5 from loosing.

**[0025]** Referring to FIG. 8, two receptacle power contacts 12 are positioned adjacent to a mating face of the mating port 14 for first engaging with and last disengaging from the first complementary connector to achieve the function of hot plug.

**[0026]** The second connector 2 comprises a second insulating housing 20 and a plurality of plug power contacts 22 retained in the second housing 20. The second housing 20 includes an L-shaped body 201, a mating tongue 202 extending rearwardly from a middle portion of the body 201 for mating with a complementary second connector (not shown), and a plate 203 extending rearwardly from the body 201 and parallel to the mating tongue 202 for latching with the complementary second connector. The second housing 20 defines a recess

204 in a front face thereof and a plurality of channels 205 extending from the mating tongue 202 through the body 201 to communicate with the recess 204. The body 201 is formed with a plurality of rearwardly extending posts 206 and latches 207 for being received in the holes 1021 and the slots 1022 of the first housing 10, respectively.

**[0027]** In conjunction with FIGS. 11-12, the plug power contacts 22 are inserted into the channels 205 of the second housing 20 and each comprise a first mating portion 220 received in the mating tongue 202 for engaging with the second complementary connector, and a second mating portion 222 extending forwardly beyond an inner face of the recess 204 for contacting with the connecting portion 122 of a corresponding receptacle power contact 12.

**[0028]** The cable 3 comprises a pair of wires 30 each include an insulating jacket 300, a pair of differential signal conductors 302 and a pair of ground conductors 304 exposed out of the jacket 300 at one end thereof.

**[0029]** Referring to FIGS. 4-6 in conjunction with FIGS. 1-3, four signal conductors 302 of the cable 3 are respectively soldered with the tail portions 112 of the four signal contacts of the first connector 1. One of the ground conductors 304 of each wire 30 is soldered with the tail portion 112 of a corresponding ground contact of the first connector 1, other two ground conductors 304 of the wires 30 are soldered to a common ground contact of the first connector 1.

**[0030]** The cover 4 is overmolded with the cable 3 and the first housing 10 after the wires 30 are soldered with the first contacts 11. The cover 4 has a pair of protrusions 40 received in the depressions 1024 of the first housing 10, and a pair

of cutouts 42 receiving the barbs 1025 of the first housing 10.

**[0031]** Referring to FIGS. 7-9 in conjunction with FIGS. 11-12, the second connector 2 is back to back assembled to the first connector 1 with the posts 206 received in the holes 1021 of the first housing 10 and with the latches 207 latching with corresponding projections 1022a in the slots 1022 to thereby interlocking the first connector 1 with the second connector 2. The second mating portions 222 of the plug power contacts 22 extend into the cavity 1020 of the first housing 10 and resiliently contact with the connecting portions 122 of the receptacle power contacts 12, respectively. The connecting portions 122 of the receptacle power contacts 12 partially extend into the recess 204 of the second housing 20. The cable assembly 1 is thus formed.

**[0032]** It can be understood that the cable assembly 100 is formed by integrating a cable connector with a power adaptor, wherein the cable connector comprises the first contacts 11 received in the first mating port 104a of the first housing 10 and the cable 3 electrically connecting with the first contacts 11 for signal transmission, and wherein the power adaptor includes the second contacts 12 received in the second mating port 104b of the first housing 10 and the second connector 2 electrically connecting with the second contacts 12 for power transmission.

**[0033]** Referring to FIGS. 7-9, a panel 8 in a computer system (not shown) to which the cable assembly 100 is mounted is shown. The cable assembly 100 is mounted to the panel 8 via a pair of bolts 9. The panel 8 defines an opening 80 and a pair of annular holes 82 at opposite sides of the opening. A cutout 84 is defined in the panel 8 and communicates with the opening 80. Each bolt 9 includes an

enlarged operating portion 80, a threaded portion 82 and a middle portion 84 interconnecting the operating portion 80 with the threaded portion 82.

**[0034]** The cable assembly 100 is assembled to the panel 8 until the front face 102a abuts against the panel 8 and the polarizing key 108 is received in the cutout 84 of the panel 8 for polarization. The pair of bolts 9 respectively protrude through the annular holes 82 of the panel 8 and the mounting holes 1071 and thread with the threaded holes 52 of the pair of screw caps 5. Because of the existence of the first blocks 1074, the screw cap 5 has no possibility of separating from the fitting space 1073 of the first insulating housing 10 when threading with the bolt 9. Because of the existence of the second and the third blocks 1075, 1076, the screw cap 5 has no possibility of turn when threading with the bolt 5 or after thread. Therefore, the cable assembly 100 is assembled to the panel 8 reliably.

**[0035]** It is to be understood, however, that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.